Torque Specifications

Description	Nm	lb-in
Battery ground cable	10	89
Steering column opening reinforcement bolts	9	80
Steering column opening cover bolts	9	80

Anti-Theft —Passive Anti-Theft System (PATS)

The passive anti-theft system (PATS) contains the following components:

- theft indicator
- encoded ignition key
- transceiver module
- instrument cluster
- powertrain control module (PCM)
- standard corporate protocol (SCP) communication network

The PATS uses radio frequency identification technology to deter a driveaway theft. Passive means that it does not require any activity from the user. This system is known as SecuriLock® in North America, Safeguard® in the U.K. and PATS in continental Europe. This information can be found in owners literature.

The PATS uses a specially encoded ignition key. Each encoded ignition key contains a permanently installed electronic device called a transponder. Each transponder contains a unique electronic identification code, with over 72 million billion combinations.

Each encoded ignition key must be programmed into the vehicle's instrument cluster (the instrument cluster is also known as a hybrid electronic cluster [HEC]), before it can be used to start the engine. There are special diagnostic procedures outlined in the workshop manual that must be carried out if new encoded ignition keys are to be installed.

The encoded key is larger than a traditional ignition key. The key does not require batteries and should last the life of the vehicle.

The transceiver module communicates with the encoded ignition key. This module is located behind the steering column shroud and contains an antenna connected to a small electronics module. During each vehicle start sequence, the transceiver module reads the encoded ignition key identification code and sends the data to the instrument cluster.

The control functions are contained in the instrument cluster. This module carries out all of the PATS functions such as receiving the identification code from the encoded ignition key and controlling engine enable. The instrument cluster initiates the key interrogation sequence when the vehicle ignition switch is turned to RUN or START.

The PATS uses the PCM to enable or disable the engine. The instrument cluster communicates with the PCM over the SCP network in order to enable engine operation. The instrument cluster and the PCM use sophisticated messages in order to prevent a theft. The instrument cluster and the PCM share security data (when first installed together) that makes them a matched pair. After this security data sharing, these modules will not function in other vehicles. The shared PCM ID is remembered even if the battery is disconnected. The instrument cluster also stores the vehicle's key identification code even if the battery is disconnected. There are special diagnostic procedures outlined in this workshop manual that may be carried out if either a new instrument cluster or PCM needs to be installed.

All elements of PATS must be functional before the engine is allowed to start. If any of the components are not working correctly, the vehicle will not start.

PATS uses a visual theft indicator. This indicator will prove out for three seconds when the ignition

switch is turned to RUN or START under normal operation. If there is a PATS problem, this indicator will either flash rapidly or glow steadily (for more than three seconds) when the ignition switch is turned to RUN or START. PATS also "blips" the theft indicator every two seconds at ignition OFF to act as a visual theft deterrent.

The PATS is not compatible with aftermarket remote start systems, which allow the vehicle to be started from outside the vehicle. These systems may reduce the vehicle security level, and also may cause no-start issues. Remote start systems must be removed before investigation of PATS-related no-start issues.

Anti-Theft —Passive Anti-Theft System (PATS)

Refer to Wiring Diagrams Cell 112 , Anti-Theft for schematic and connector information.

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

Special Tool(s)

ST1137-A	73III Automotive Meter 105-R0057 or equivalent
ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

Inspection and Verification

NOTE: PATS must be reconfigured upon installment of a new instrument cluster. Refer to Section 418-00 .

1. Verify the customer concern by duplicating the condition.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
● Ignition lock cylinder ● Encoded ignition key (PATS key) ● Use of non-encoded ignition key (key without the molded plastic head, non-PATS key) ● Use of a non-programmed encoded ignition key	● Central junction box fuses: ■ 5 (15A) ■ 21 (5A) ■ 34 (20A) ● PATS transceiver ● Connectors ● Ignition switch

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
   - check that the program card is correctly installed.

- check the connections to the vehicle.
- check the ignition switch position.

4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.

5. Carry out the DATA LINK DIAGNOSTIC TEST. If diagnostic tool responds with:
   - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to Section 418-00 .
   - NO RESP/NOT EQUIP for instrument cluster, go to Pinpoint Test A.
   - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the instrument cluster.

6. If the DTCs retrieved are related to the concern, go to Instrument Cluster Diagnostic Trouble Code (DTC) Index to continue diagnostics.

7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Instrument Cluster Diagnostic Trouble Code (DTC) Index

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1202	Fuel Sender Open Circuit	ICM	REFER to Section 413-01 .
B1204	Fuel Sender Short to Ground	ICM	REFER to Section 413-01 .
B1213	Anti-Theft Number of Programmed Keys is Below Minimum	ICM	GO to Pinpoint Test D .
B2103 or B1232	Antenna Not Connected — Defective Transceiver	ICM	GO to Pinpoint Test E .
B1317	Battery Voltage High	ICM	REFER to Section 414-00 .
B1318	Battery Voltage Low	ICM	REFER to Section 414-00 .
B1342	ECU Is Defective	ICM	REFER to Section 413-01 .
B1356	Ignition Run Circuit Open	ICM	REFER to Section 211-05 .
B1364	Ignition Start Circuit Open	ICM	REFER to Section 211-05 .
B1600	PATS Ignition Key Transponder Signal Is Not Received — Damaged Key or Non-PATS Key	ICM	GO to Pinpoint Test F .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder (Unprogrammed Encoded Ignition Key)	ICM	GO to Pinpoint Test G .
B1602	PATS Received Invalid Format Of Key-Code From Ignition Key Transponder (Partial Key Read)	ICM	GO to Pinpoint Test H .
B1681	PATS Transceiver Signal Is Not Received (Not Connected, Damaged, or Wiring)	ICM	GO to Pinpoint Test I .

B2139	PCM ID Does Not Match Between Instrument Cluster and PCM	ICM	GO to Pinpoint Test J .
B2141	NVM Configuration Failure (No PCM ID Exchange Between Instrument Cluster and PCM)	ICM	GO to Pinpoint Test K .
B2143	NVM Memory Failure	ICM	REFER to Section 413-01
C1284	Oil Pressure Switch Failure	ICM	REFER to Section 413-01 .
U1147	SCP Invalid or Missing Data for Vehicle Security	PCM/SCP	GO to Pinpoint Test C .
U1262	Missing SCP Message	J1850	REFER to Section 418-00 .

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action

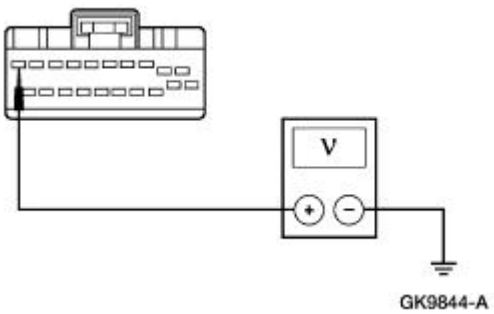
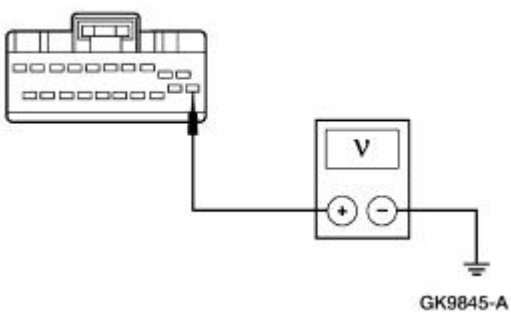
• No communication with the instrument cluster	• Central junction box Fuses:
	  ■ 5 (15A)
	  ■ 21 (5A)
	  ■ 34 (20A)
	• Circuitry
	• Instrument cluster
		• GO to Pinpoint Test A .

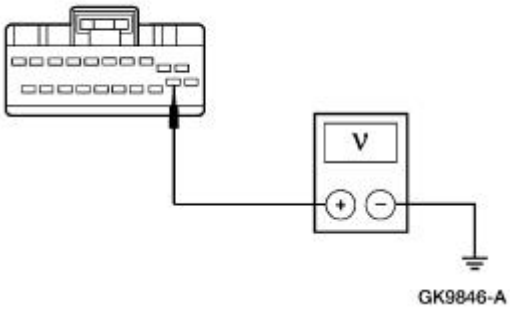
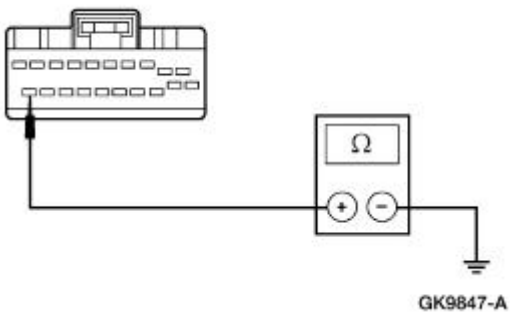
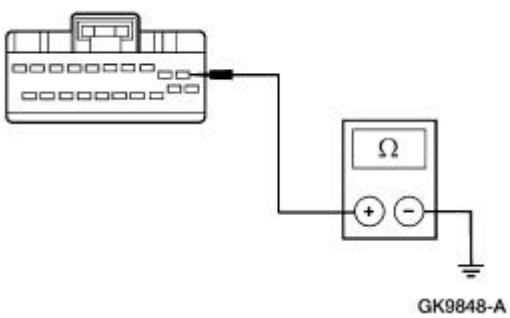
• The anti-theft indicator is always/never on — no three second theft indicator prove out	• Instrument cluster • Theft indicator	• GO to Pinpoint Test B .
• The vehicle does not start — theft indicator proves out for three seconds as normal	• Less than two keys programmed to the system • Transceiver not connected/defective • Circuitry • Transceiver internal antenna damaged • NON-PATS key, damaged key or no code received • Partial key read of PATS key • Unprogrammed PATS key	• CARRY OUT Instrument Cluster On-Demand Self-Test. RETRIEVE DTCs. If DTCs are present, GO to Instrument Cluster Diagnostics Trouble Code (DTC) Index. If no DTCs are retrieved, CHECK for other possible no-start causes.
	• No PCM ID stored in PATS • PATS/PCM ID do not match • Problem with SCP link	• CLEAR the stored DTCs. CYCLE the ignition key from OFF to RUN. RETRIEVE continuous DTCs. If DTCs are present, GO to Instrument Cluster Diagnostics Trouble Code (DTC) Index. If no

		DTCs are retrieved, CHECK for other possible causes.
• The anti-theft system does not operate correctly — the vehicle starts but flashes a fault code on the theft indicator at key on	• Incorrect PCM calibration	• GO to Pinpoint Test C .

Pinpoint Tests

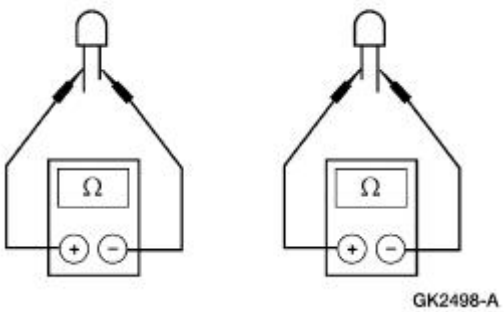
PINPOINT TEST A: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER

Test Step	Result / Action to Take
A1 CHECK THE BATTERY POWER SUPPLY TO THE INSTRUMENT CLUSTER	
• Key in OFF position. • Disconnect: Instrument Cluster C220b. • Measure voltage between instrument cluster C220b Pin 10, Circuit 729 (RD/WH), harness side and ground.  GK9844-A • **Is the voltage greater than 10 volts?**	**Yes** GO to A2 . **No** REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.
A2 CHECK THE RUN POWER SUPPLY TO THE INSTRUMENT CLUSTER	
• Key in ON position. • Measure the voltage between instrument cluster C220b Pin 11, Circuit 489 (PK/BK), harness side and ground.  GK9845-A • **Is the voltage greater than 10 volts?**	**Yes** GO to A3 . **No** REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.
A3 CHECK RUN/START POWER SUPPLY TO THE INSTRUMENT	

CLUSTER	
• Measure the voltage between the instrument cluster C220b Pin 12, Circuit 20 (WH/LB), harness side and ground.  GK9846-A • **Is the voltage greater than 10 volts?**	**Yes** GO to A4 . **No** REPAIR Circuit 20 (WH/LB). REPEAT the self-test. CLEAR the DTCs.
A4 CHECK GROUND CIRCUIT 397 (BK/WH) FOR AN OPEN	
• Key in OFF position. • Measure the resistance between instrument cluster C220b Pin 20, Circuit 397 (BK/WH), harness side and ground.  GK9847-A • **Is the resistance less than 5 ohms?**	**Yes** GO to A5 . **No** REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.
A5 CHECK GROUND CIRCUIT 1205 (BK) FOR OPEN	
• Measure the resistance between instrument cluster C220b Pin 1, Circuit 1205 (BK), harness side and ground.  GK9848-A • **Is the resistance less than 5 ohms?**	**Yes** REFER to Section 418-00 . **No** REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST B: THE ANTI-THEFT INDICATOR IS ALWAYS/NEVER ON — NO THREE SECOND THEFT INDICATOR PROVE OUT

Test Step	Result / Action to Take
B1 ENTER THE INSTRUMENT CLUSTER ACTIVE COMMAND MODE	

• Key in OFF position. • Connect the diagnostic tool. • Enter the instrument cluster active command mode. • **Can the instrument cluster active command mode be entered?**	**Yes** GO to B2 . **No** Go To Pinpoint Test A .
B2 TRIGGER THE ANTI-THEFT INDICATOR	
• Trigger the instrument cluster active command WARNING LAMPS AND CHIME to ON. • **Does the anti-theft indicator illuminate?**	**Yes** The anti-theft indicator is OK. VERIFY the concern with the customer. **No** GO to B3 .
B3 CHECK THE ANTI-THEFT INDICATOR	
• Key in OFF position. • Disconnect: Anti-Theft LED. • Measure the resistance between the pins of the anti-theft LED in both directions.  GK2498-A • **Is the resistance greater than 10,000 ohms in one direction, and 10-20 ohms in the other direction?**	**Yes** INSTALL a new instrument cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition to RUN using two encoded ignition keys. Go To Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. **No** INSTALL a new anti-theft LED. For additional information, REFER to Section 413-01 . REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST C: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — THE VEHICLE STARTS BUT FLASHES A FAULT CODE ON THE THEFT INDICATOR AT KEY ON

Test Step	Result / Action to Take
C1 CHECK THE ANTI-THEFT INDICATOR FOR CORRECT OPERATION	
• Key in START position. • Verify the theft indicator proves out correctly. • **Does the vehicle start once the theft proves out?**	**Yes** If the vehicle starts, VERIFY correct PCM calibration for vehicle. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual Section 3. **No** GO to C2 .
C2 CHECK THE PCM DIAGNOSTIC CAPABILITY	
• Connect the diagnostic tool. • Retrieve and document continuous DTCs. • Enter the following	**Yes** GO to C3 . **No** REFER to Section 418-00 .

diagnostic mode on the diagnostic tool: Clear Continuous DTCs. ● Enter the following diagnostic mode on the diagnostic tool: PCM Self-Test. ● **Does diagnostic tool communicate with the PCM?**	
C3 RETRIEVE THE PCM DTCS ● Retrieve and document continuous DTCs. ● **Is DTC P1260 recorded?**	**Yes** GO to C4 . **No** VERIFY PCM power and ground. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual Section 3.
C4 CHECK THE COMMUNICATION NETWORK ● Repeat Inspection and Verification steps 3 through 7; refer to Inspection and Verification. ● Key in OFF position. ● Retrieve and document continuous DTCs. ● Enter the following diagnostic mode on the diagnostic tool: Clear Continuous DTCs. ● Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. ● **Is DTC U1147 retrieved?**	**Yes** INSTALL a new instrument cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition to RUN using two encoded ignition keys. Go To Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. If DTC U1147 is still present, INSTALL a new PCM; for additional information, REFER to Section 303-14 . TEST the system for normal operation. (You must follow Pinpoint Test J to initialize module.) **No** System is OK.

PINPOINT TEST D: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — ANTI-THEFT NUMBER OF PROGRAMMED KEYS IS BELOW MINIMUM

Test Step	Result / Action to Take
D1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TESTS ● Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. ● **Is DTC B1213 the only DTC retrieved?**	**Yes** GO to D2 . **No** REPAIR the other DTCs retrieved. REPEAT the Instrument Cluster On-Demand Self-Test. CLEAR the DTCs.
D2 CHECK FOR PROGRAMMED	

ENCODED IGNITION KEYS — MONITOR THE INSTRUMENT CLUSTER PID NUMKEYS	
• Monitor the instrument cluster PID NUMKEYS. • **Does the instrument cluster PID NUMKEYS display less than two encoded ignition keys programmed?**	**Yes** GO to D3 . **No** System is OK.
D3 PROGRAM ENCODED IGNITION KEYS	
• **NOTE:** Two programmed encoded ignition keys must be available to start the vehicle. • Cut a new encoded ignition key. • Key in ON position. • Program the new encoded ignition key. • **Does the theft indicator illuminate for three seconds, and then go out?**	**Yes** CLEAR the DTCs. CARRY OUT the Instrument Cluster On-Demand Self-Test to verify all codes have been cleared. REPEAT the self-test. CLEAR the DTCs. **No** If the theft indicator is on continuously, REPEAT TEST STEP D3 with a second new encoded ignition key. If the theft indicator is flashing, RETRIEVE DTCs stored for the new fault and REPAIR the other DTC(s) retrieved.

PINPOINT TEST E: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — ANTENNA NOT CONNECTED OR DEFECTIVE TRANSCEIVER

Test Step	Result / Action to Take
E1 INSPECT THE PATS TRANSCEIVER FOR CORRECT INSTALLATION	
• Key in OFF position. • Verify the PATS transceiver is correctly installed; refer to Module—Passive Anti-Theft Transceiver . • Connect the diagnostic tool. • Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. • Retrieve and document continuous DTCs. • Enter the following diagnostic mode on the diagnostic tool: Clear Continuous DTCs. • **Is DTC B1232 or B2103 retrieved?**	**Yes** INSTALL a new PATS transceiver module; for additional information, REFER to Module—Passive Anti-Theft Transceiver . REPEAT the Instrument Cluster On-Demand Self-Test. CLEAR the DTCs. **No** System is OK.

PINPOINT TEST F: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS IGNITION KEY TRANSPONDER SIGNAL IS NOT RECEIVED (DAMAGED KEY OR NON-PATS KEY)

Test Step	Result / Action to Take
NOTE: Large metallic objects, electronic debit transponder devices or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary problem if they are too close to the key during engine start. If a problem occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to ensure the encoded ignition key used by the customer is an approved Ford encoded ignition key (encoded ignition keys from Rotunda, Ilco, Curtis, or Strattec are approved Ford encoded ignition keys).	
F1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TESTS ● Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. ● **Is DTC B1600 retrieved?**	**Yes** GO to F2 . **No** If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index. If no DTCs are retrieved, system is OK.
F2 PROGRAM A NEW ENCODED IGNITION KEY ● Key in OFF position. ● **NOTE:** Check to make sure the customer and replacement encoded ignition keys are approved Ford encoded PATS ignition keys. Unapproved PATS keys do not always operate correctly over different temperature ranges (encoded ignition keys from Rotunda, Ilco, or Strattec are approved encoded ignition keys). ● Cut a new encoded ignition key. ● Key in ON position. ● Program the new encoded ignition key; for additional information, refer to Key Programming—Erase All Key Codes and Program Two Keys . ● Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. ● **Is DTC B1600 still present?**	**Yes** GO to F3 . **No** If no other DTCs are retrieved, system is OK. If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.
F3 INSTALL A NEW PATS TRANSCEIVER ● Key in OFF position. ● Install a new PATS transceiver; for additional information, refer to Module—Passive Anti-Theft Transceiver . ● Key in ON position. ● **NOTE:** Use the customer's original encoded ignition key, not the encoded ignition key that was cut in the previous step. ● Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. ● **Is DTC B1600 retrieved?**	**Yes** INSTALL a new instrument cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition to RUN using two encoded ignition keys. Go To Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. **No** System is OK.

PINPOINT TEST G: THE ANTI-THEFT SYSTEM DOES NOT OPERATE

CORRECTLY — PATS RECEIVED INCORRECT KEY-CODE FROM IGNITION KEY TRANSPONDER (UNPROGRAMMED ENCODED IGNITION KEY)

Test Step	Result / Action to Take
NOTE: Large metallic objects, electronic debit transponder devices or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary problem if they are too close to the key during engine start. If a problem occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to ensure the encoded ignition key used by the customer is an approved Ford encoded ignition key (encoded ignition keys from Rotunda, Ilco, Curtis, or Strattec are approved Ford encoded ignition keys).	
G1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF TESTS ● Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. ● **Is DTC B1601 recorded?**	**Yes** GO to G2 . **No** System is OK. CHECK all customer encoded ignition keys with Instrument Cluster On-Demand Self-Test to verify all other encoded ignition keys are programmed.
G2 CHECK FOR PROGRAMMED ENCODED IGNITION KEYS — MONITOR THE INSTRUMENT CLUSTER PID NUMKEYS ● Monitor the instrument cluster PID NUMKEYS. ● **Does the instrument cluster PID NUMKEYS display 8?**	**Yes** ERASE and REPROGRAM the key codes; for additional information, REFER to Key Programming—Erase All Key Codes and Program Two Keys . REPEAT the self-test. CLEAR the DTCs. **No** GO to G3 .
G3 CHECK THE NUMBER OF PROGRAMMED ENCODED IGNITION KEYS AVAILABLE ● Verify there are at least two currently programmed encoded ignition keys available with the vehicle. ● **Are at least two currently programmed encoded ignition keys available with the vehicle?**	**Yes** GO to G4 . **No** CUT a new encoded ignition keys so that at least two encoded ignition keys are available. PROGRAM the encoded ignition keys; Key Programming—Erase All Key Codes and Program Two Keys . GO to G4 .
G4 VERIFY THE INSTRUMENT CLUSTER PID SPARE_KY INDICATES ENABLE ● Monitor the instrument cluster PID SPARE_KY. ● **Does the instrument cluster PID SPARE_KY indicate ENABLE?**	**Yes** REFER to Key Programming—Erase All Key Codes and Program Two Keys . CLEAR the DTCs, REPEAT the self-testGO to G5 . **No** REFER to Key Programming—Enable/Disable Spare

	Key Programming to enable the PID SPARE KEY to ENABLE. TEST the system for normal operation. Once completed, GO to G5.
G5 CHECK THE ENCODED IGNITION KEYS FOR CORRECT OPERATION • Key in OFF position. • Key in ON position. • Start the vehicle using the first encoded ignition key. • Key in ON position. • Start the vehicle with the second ignition key. • Key in OFF position. • **Does the vehicle start correctly using both encoded ignition keys?**	**Yes** System is OK. If there are additional keys that need to be programmed, for additional information, REFER to Key Programming—Program a Key Using Two Programmed Keys. **No** GO to G6.
G6 RETRIEVE THE INSTRUMENT CLUSTER DTCS — CHECK FOR DTC B1601 • Retrieve and document continuous DTCs. • Enter the following diagnostic mode on the diagnostic tool: Clear Continuous DTCs. • Carry out a instrument cluster self-test using both ignition keys from Step G5. • **Is DTC B1601 retrieved?**	**Yes** INSTALL a new instrument cluster; for additional information, REFER to Section 413-01. CYCLE the ignition to RUN using two encoded ignition keys. GO to Pinpoint Test J to initialize the vehicle. REPEAT the self-test. CLEAR the DTCs. **No** System is OK. If other DTCs are retrieved, REFER to Instrument Cluster Module Diagnostic Trouble Code (DTC) Index.

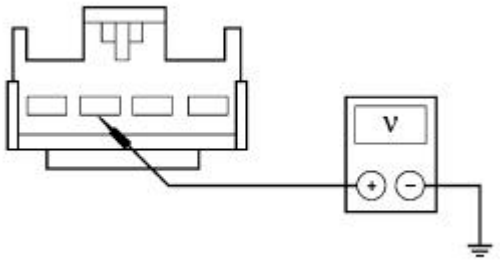
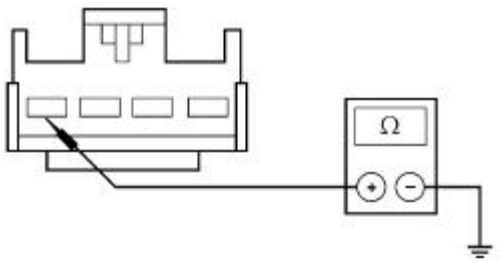
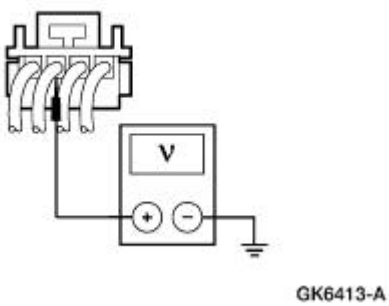
PINPOINT TEST H: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS RECEIVED INVALID FORMAT OF KEY-CODE FROM IGNITION KEY TRANSPONDER (PARTIAL KEY READ)

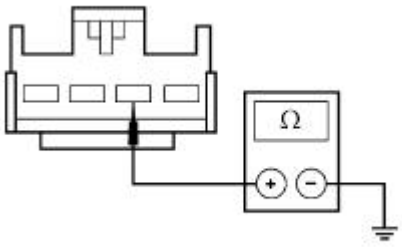
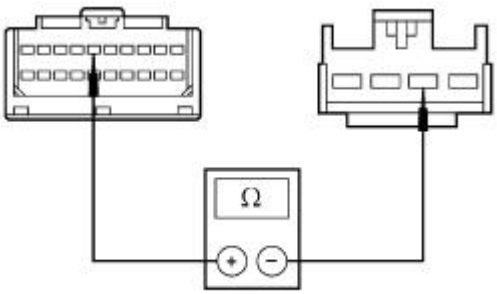
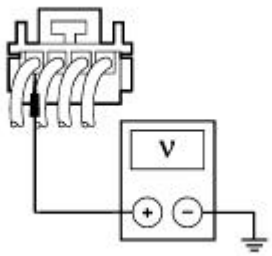
Test Step	Result / Action to Take
NOTE: Large metallic objects, electronic debit transponder devices or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary problem if they are too close to the key during engine start. If a problem occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to ensure the encoded ignition key used by the customer is an approved Ford encoded ignition key (encoded ignition keys from Rotunda, Ilco, Curtis, or Strattec are approved Ford encoded ignition keys).	
H1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF TESTS • Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. • **Is DTC B1602 retrieved?**	**Yes** GO to H2. **No** System is OK. CHECK all customer encoded ignition keys with Instrument Cluster On-Demand Self-Test to verify all other keys are programmed.

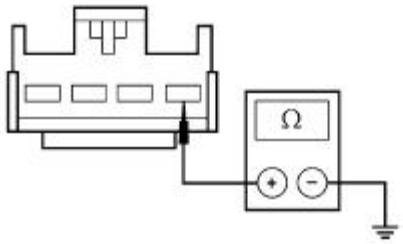
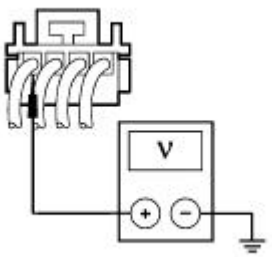
H2 OBTAIN A NEW ENCODED IGNITION KEY	
• Key in OFF position. • Cut a new encoded ignition key. • Key in ON position. • Program a new encoded ignition key; for additional information, refer to Key Programming—Erase All Key Codes and Program Two Keys . • Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. • **Is DTC B1602 retrieved?**	**Yes** GO to H3 . **No** System is OK. If the customer has any remaining encoded keys at home, instruct them to carry out Key Programming—Program a Key Using Two Programmed Keys on each remaining key. This procedure is detailed in the Owners Guide.
H3 INSTALL A NEW PATS TRANSCEIVER	
• Key in OFF position. • Install a new PATS transceiver; for additional information, refer to Module—Passive Anti-Theft Transceiver . • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. • **Are any DTCs retrieved?**	**Yes** REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index. **No** System is OK.

PINPOINT TEST I: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS TRANSCEIVER SIGNAL IS NOT RECEIVED (NOT CONNECTED, DAMAGED, OR WIRING)

Test Step	Result / Action to Take
I1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF TESTS	
• Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. • **Is DTC B1681 retrieved?**	**Yes** GO to I2 . **No** System is OK.
I2 CHECK THE PATS TRANSCEIVER FOR VOLTAGE — CIRCUIT 20 (WH/LB)	
• Key in OFF position. • Disconnect: PATS Transceiver C252. • Key in ON position. • Measure the voltage between PATS transceiver C252 Pin 2, Circuit 20 (WH/LB), harness side and ground.	**Yes** GO to I3 . **No** REPAIR Circuit 20 (WH/LB). REPEAT the self-test. CLEAR the DTCs.

 GK2493-A ● **Is the voltage greater than 9 volts?**	
I3 CHECK THE PATS TRANSCEIVER GROUND — CIRCUIT 397 (BK/WH)	
● Key in OFF position. ● Measure the resistance between PATS transceiver C252 Pin 1, Circuit 397 (BK/WH), harness side and ground.  GK2494-A ● **Is the resistance less than 5 ohms?**	**Yes** GO to I4 . **No** REPAIR Circuit 397 (BK/WH). REPEAT the self-test. CLEAR the DTCs.
I4 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR VOLTAGE — CIRCUIT 1216 (GY/OG)	
● Connect: PATS Transceiver C252. ● Key in ON position. ● Measure the voltage by back probing between PATS transceiver C252 Pin 3, Circuit 1216 (GY/OG), harness side and ground.  GK6413-A ● **Is the voltage greater than 9 volts?**	**Yes** GO to I6 . **No** GO to I5 .
I5 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR SHORT TO GROUND — CIRCUIT 1216 (GY/OG)	
● Key in OFF position. ● Disconnect: PATS Transceiver C252. ● Measure the resistance between PATS transceiver C252 Pin 3, Circuit 1216 (GY/OG), harness side and ground.	**Yes** GO to I6 . **No** CHECK Circuit 1216 (GY/OG) for short to ground. If the circuit is OK, INSTALL a new instrument

 GK6404-A ● **Is the resistance greater than 100 ohms?**	cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition key to RUN using two encoded ignition keys. GO to Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the circuit is not OK, REPAIR Circuit 1216 (GY/OG). CLEAR the DTCs. TEST the system for normal operation.
I6 CHECK CIRCUIT 1216 (GY/OG) FOR OPEN ● Key in OFF position. ● Disconnect: PATS Transceiver C252. ● Disconnect: Instrument Cluster C220a. ● Measure the resistance between PATS transceiver C252 Pin 3, Circuit 1216 (GY/OG), harness side and instrument cluster C220a Pin 7, Circuit 1216 (GY/OG), harness side.  GK8239-A ● **Is the resistance less than 5 ohms?**	**Yes** GO to I7 . **No** REPAIR Circuit 1216 (GY/OG). CLEAR the DTCs. TEST the system for normal operation.
I7 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR VOLTAGE — CIRCUIT 1215 (WH/LG) ● Key in OFF position. ● Connect: PATS Transceiver C252. ● Connect: Instrument Cluster C220a. ● Key in ON position. ● Measure the voltage by back probing between PATS transceiver C252 Pin 4, Circuit 1215 (WH/LG), harness side and ground.  GK6414-A ● **Is the voltage greater than 9 volts?**	**Yes** GO to I9 . **No** GO to I8 .
I8 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR OPEN — CIRCUIT 1215 (WH/LG) ● Key in OFF position. ● Disconnect: PATS Transceiver C252. ● Measure the resistance between PATS transceiver	**Yes** GO to I9 .

C252 Pin 4, Circuit 1215 (WH/LG), harness side and ground.  GK6405-A • **Is the resistance greater than 100 ohms?**	**No** CHECK Circuit 1215 (WH/LG) for short to ground. If the circuit is OK, INSTALL a new instrument cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition to RUN using two encoded ignition keys. GO to Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the circuit is not OK, REPAIR Circuit 1215 (WH/LG). REPEAT the self-test. CLEAR the DTCs.
I9 CHECK THE PATS TRANSMIT CIRCUIT FOR CORRECT OPERATION — CIRCUIT 1215 (WH/LG)	
• Connect: PATS Transceiver C252. • Key in ON position. • Trigger the instrument cluster active command RF SIGNAL to ON. • Measure the voltage by back probing between PATS transceiver C252 Pin 4, Circuit 1215 (WH/LG), harness side and ground.  GK6414-A • **Does the voltage drop from greater than 9 volts to less than 1 volt when the instrument cluster active command is triggered on?**	**Yes** GO to I10 . **No** CHECK Circuit 1215 (WH/LG) for continuity to instrument cluster C220aPin 8. If the circuit is OK, INSTALL a new instrument cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition to RUN using two encoded ignition keys. GO to Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the circuit is not OK, REPAIR Circuit 1215 (WH/LG). REPEAT the self-test. CLEAR the DTCs.
I10 CHECK THE PATS SYSTEM WITH A NEW PATS TRANSCEIVER INSTALLED	
• Key in OFF position. • Install a new PATS transceiver; for additional information, refer to Anti-Theft—Passive Anti-Theft System (PATS) . • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. • **Is DTC B1681 retrieved?**	**Yes** GO to I11 . **No** System is OK.
I11 CHECK THE PATS SYSTEM WITH NEW INSTRUMENT CLUSTER	
• Key in OFF position. • Install a new instrument cluster; for additional information, refer to Section 413-01 . Cycle the ignition to RUN using two encoded ignition keys. Go to Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. • **Is DTC B1681 retrieved?**	**Yes** REPAIR Circuit 397 (BK/WH), 20 (WH/LB), 1215 (WH/LG), and 1216 (GY/OG). REPEAT the self-test. CLEAR the DTCs. **No** If no DTCs are retrieved, the system is OK.

	If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.

PINPOINT TEST J: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PCM ID DOES NOT MATCH BETWEEN INSTRUMENT CLUSTER AND PCM

Test Step	Result / Action to Take
J1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF TESTS	
• Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. • **Is DTC B2139 recorded?**	**Yes** GO to J2 . **No** System is OK.
J2 CLEAR PCM ID FROM INSTRUMENT CLUSTER AND PCM	
• Carry out the security access procedure for the instrument cluster. For additional information, refer to Security Access—Procedure . • **NOTE:** DO NOT carry out ignition key code erase. • Select FSF card PARAMETER RESET command for instrument cluster. • Use diagnostic card for PCM Active Command Keep Alive Memory Reset. • Key in OFF position. • Select FSF card PARAMETER RESET command for PCM. • Key in ON position. • Turn the ignition switch to RUN for three seconds. • Enter the following diagnostic mode on the diagnostic tool: Clear Continuous DTCs. • Key in OFF position. • Enter the following diagnostic mode on the diagnostic tool: Retrieve Continuous DTCs. • **Is DTC B2139 retrieved?**	**Yes** VERIFY PCM calibration is correct for the vehicle. If correct, REPEAT Step J2. If fault code persists, INSTALL a new instrument cluster; for additional information, REFER to Section 413-01 . CYCLE the ignition to RUN using two encoded ignition keys. REPEAT Pinpoint Test J . CLEAR the DTCs. TEST the system for normal operation. If DTC B2139 still exists, INSTALL a new PCM; for additional information, REFER to Section 303-14 . REPEAT the self-test. CLEAR the DTCs. **No** System is OK. CHECK for any other DTCs. REFER to the instrument cluster Diagnostic Trouble Code Index.

PINPOINT TEST K: THE ANTI-THEFT SYSTEM DOES NOT OPERATE

CORRECTLY — NVM CONFIGURATION FAILURE (NO PCM ID EXCHANGED BETWEEN INSTRUMENT CLUSTER AND PCM)

Test Step	Result / Action to Take
K1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF TESTS ● Use the recorded results from the Instrument Cluster Continuous and On-Demand Self-Tests. ● **Are any DTCs recorded?**	**Yes** If DTC B2141 only is retrieved, GO to K2 . If DTC U1147 is retrieved with DTC B2141, GO to Pinpoint Test C . **No** System is OK.
K2 CARRY OUT KEEP ALIVE MEMORY RESET FROM PCM ● Use diagnostic card for PCM Active Command — Keep Alive Memory Reset. ● Key in OFF position. ● Key in ON position. ● Leave the key in the run position for thirty seconds. ● Key in OFF position. ● Start the vehicle. ● **Does the vehicle start?**	**Yes** System is OK. **No** GO to K3 .
K3 RETRIEVE THE INSTRUMENT CLUSTER DTCS ● Enter the following diagnostic mode on the diagnostic tool: Clear Continuous DTCs. ● Key in OFF position. ● Key in ON position. ● Key in OFF position. ● Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster On-Demand Self-Test. ● **Is DTC B2141 retrieved?**	**Yes** REPEAT K2. If the fault persists, verify the PCM calibration. If the calibration is OK, INSTALL a new instrument cluster. for additional information, REFER to Section 413-01 . Cycle the ignition key to run using two encoded ignition keys. GO to Pinpoint Test J to initialize the module. REPEAT the self-test. CLEAR the DTCs. **No** REFER to the DTC index.

Key Programming —Erase All Key Codes and Program Two Keys

Special Tool(s)

ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool

NOTE: This procedure is used when a customer needs keys programmed into the system and does not have two programmed ignition keys available. This procedure is also useful when programmed ignition key(s) have been lost or the ignition switch assembly has been replaced, and it is desired to erase key(s) from the passive anti-theft system (PATS) memory.

NOTE: This procedure will erase all programmed ignition keys from the vehicle memory and the vehicle will not start until two keys have been reprogrammed to the vehicle.

NOTE: Two PATS encoded keys with the correct mechanical cut must be available to perform this procedure. One or both of them may be the customer's original keys.

NOTE: If additional keys are to be programmed, refer to Key Programming — Program a Key Using Two Programmed Keys. If the remaining keys are with the customer and are not available with the vehicle, then instruct the customer to refer to the Owners Guide under the "Programming Spare [SecuriLock ® (North America), Safeguard ® (U.K.) or PATS for all other markets] Keys Procedure" for instructions on programming the remaining keys.

1. Turn the ignition switch from OFF to RUN.
2. Enter diagnostic tool. Follow the SECURITY ACCESS PROCEDURE to obtain security access.
3. From diagnostic tool menu, select IGNITION KEY CODE ERASE.
4. **NOTE:** Do NOT select any additional commands from this menu.

   Turn the ignition switch to OFF and disconnect diagnostic tool.
5. Insert the first encoded key into the ignition lock cylinder and turn the switch to RUN for three seconds.
6. Insert the second encoded key into the ignition lock cylinder and turn the switch to RUN for three seconds.
7. The vehicle should now start with both ignition keys.

Key Programming —Program a Key Using Two Programmed Keys

Special Tool(s)

ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

NOTE: This procedure only works if two or more programmed ignition keys are available and it is desired to program additional key(s). If two keys are not available, follow the procedure in Key Programming—Erase All Key Codes and Program Two Keys .

NOTE: PID SPARE_KY must be enabled for this procedure to operate. If this Parameter Identification (PID) Index is not enabled, follow the security access procedure and select Spare Key Programming Switch: Enabled.

NOTE: If the programming procedure is successful, the new key(s) will start the vehicle and the THEFT INDICATOR will illuminate for approximately three seconds.

NOTE: If the programming procedure is not successful, the new key(s) will not start the vehicle and the THEFT INDICATOR will flash. If the programming procedure was not successful, repeat the key programming procedure from Step 1. If the failure repeats, check Circuit 729 (RD/WH) (hot at all times) in instrument cluster for proper battery voltage. Repair the circuit if voltage is not present. For additional information, refer to Diagnosis and Testing to review diagnostic trouble codes (DTCs) and perform pinpoint tests as required.

NOTE: A maximum of eight ignition keys can be programmed to a passive anti-theft system (PATS) equipped vehicle. Use PID NUMKEYS to determine how many keys are programmed to the vehicle.

NOTE: If the steps are not performed as outlined, the programming procedure will end.

NOTE: Ignition keys must have correct mechanical key cut for the vehicle and must be a PATS encoded key.

1. Insert the first programmed ignition key into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for one second).

2. Turn the ignition switch to OFF and remove the first key from the ignition lock cylinder.

3. Within five seconds of turning the ignition switch to OFF, insert the second programmed ignition key into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for one second).

4. Turn the ignition switch to OFF and remove the second key from the ignition lock cylinder.

5. Within 10 seconds of turning the ignition lock cylinder to OFF, insert the unprogrammed ignition key (new key) into the ignition lock cylinder and turn the ignition switch from OFF to RUN

(maintain the ignition switch in RUN for 1 second).

6. If it is desired to program additional key(s), repeat the key programming procedure from the beginning.

Key Programming —Enable/Disable Spare Key Programming

Special Tool(s)

ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

NOTE: The spare key programming switch is a diagnostic tool programmable switch that provides the capability to enable/disable the spare key programming procedure. This procedure is in the Owners Guide spare key programming procedure or in this section under Key Programming—Program a Key Using Two Programmed Keys . This programmable switch is provided as a convenience for rental company fleets or other fleet purchasers who may not want the spare key programming procedure available to the vehicle driver.

NOTE: The spare key programming switch state can be viewed by instrument cluster PID SPARE_KY.

1. Insert a programmed ignition key into the ignition lock cylinder and turn the ignition switch to RUN.

2. Enter diagnostic tool. Follow the SECURITY ACCESS PROCEDURE. For additional information, refer to Security Access—Procedure to obtain security access.

3. **NOTE:** The default setting on delivery of all new vehicles is <ENABLE>.

   From diagnostic tool menu, select SPARE KEY PROGRAMMING SWITCH selection to the desired setting:
   <ENABLE> Spare key programming procedure is accessible.
   <DISABLE> Spare key programming procedure is not accessible.

Key Programming —Additional Key With One Programmed Key

Special Tool(s)

ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

NOTE: This procedure is used when a customer needs to have an additional key programmed into the vehicle without erasing stored key codes, but does not have two programmed keys available. This procedure is also useful when attempting to determine if an ignition key is defective, as a new key can be installed without erasing keys or without having two programmed keys available.

NOTE: Before programming, the new key must have the correct mechanical cut for the ignition lock.

NOTE: If eight keys are already programmed, this procedure will not allow any further ignition keys to be programmed without erasing all stored key codes first. The number of keys programmed into the system can be determined using the PID NUMKEYS.

1. Turn the ignition switch from the OFF position to the RUN position using the new, unprogrammed ignition key.

2. Enter diagnostic tool using the Ford Service Function (FSF) card and enter the appropriate instrument cluster. Follow Security Access to obtain security access. For additional information, refer to Security Access—Procedure .

3. From the diagnostic tool menu Select: IGNITION KEY CODE PROGRAM.

4. Turn the ignition switch to the OFF position and disconnect diagnostic tool.

5. Attempt to start the engine with the new ignition key. The vehicle engine should start and run normally.

Security Access —Procedure

Special Tool(s)

ST2332-A	Worldwide 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

NOTE: The security access procedure is utilized to obtain passive anti-theft system (PATS) security access. PATS security access must be granted to erase ignition keys, enable/disable the spare key programming switch or perform parameter resets for the instrument cluster. The security access procedure invokes an inherent 10 minute time delay prior to granting security access during which diagnostic tool must remain connected to the vehicle. Once security access has been granted, a security access command menu is displayed that offers various command options (refer to PATS Configuration Command Index).

NOTE: Select only the commands required by the appropriate pinpoint test.

1. From diagnostic tool: Using the Ford Service Function (FSF) card, select the appropriate instrument cluster. Enter SECURITY ACCESS PROCEDURE. This procedure will take 10 minutes to perform, during which the ignition switch must be in RUN and the diagnostic tool must be connected to the vehicle.

2. After the 10-minute security access procedure has been completed, a new menu will be displayed with command options. Select only those functions required before exiting out of this menu. Once exited out of this menu, the security access procedure must be performed again to perform additional commands.

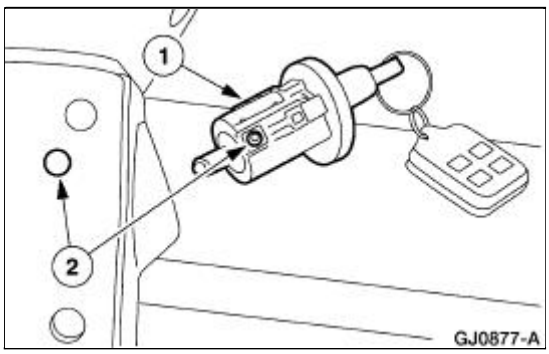
Module —Passive Anti-Theft Transceiver

Removal

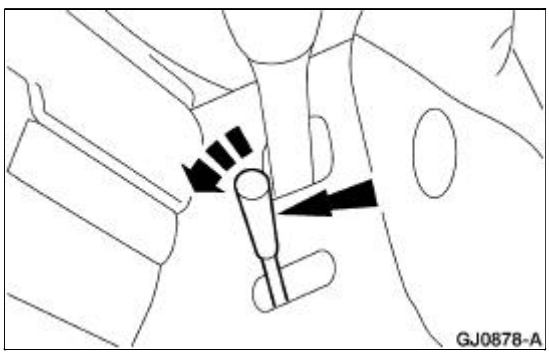
1. **CAUTION: Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.**

   Disconnect the battery ground cable (14301).

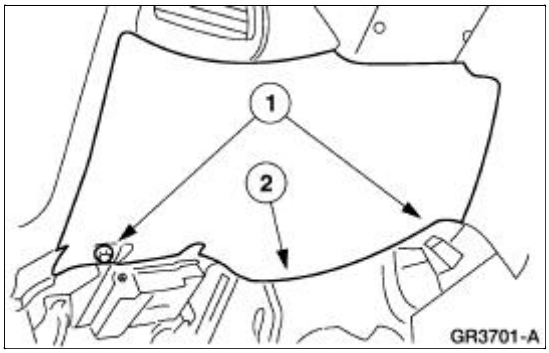
2. Remove the ignition switch lock cylinder (11582).
   1. Insert the ignition key into the ignition switch lock cylinder and turn to the RUN position.
   2. Insert a punch in the access hole of the steering column and press the release tab while pushing out the ignition switch lock cylinder.



3. Unscrew the tilt wheel handle and shank and remove.

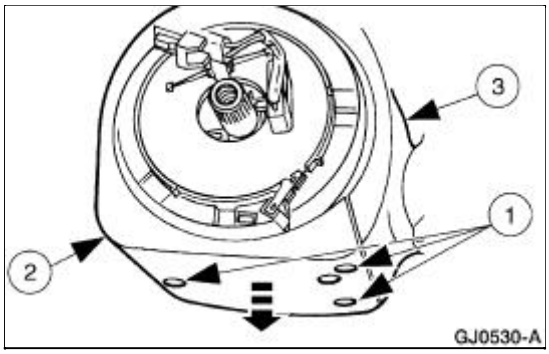


4. Remove the instrument panel steering column opening cover.
   1. Remove the screws.
   2. Remove the LH instrument panel steering column opening cover.

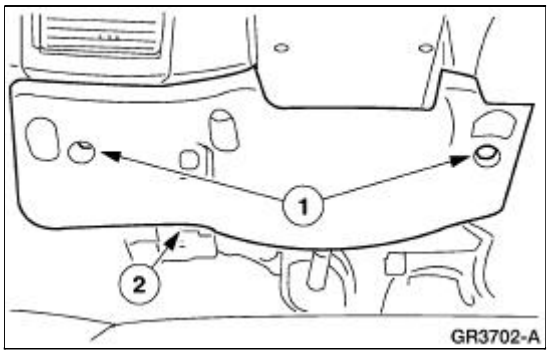


5. **NOTE:** The steering wheel has been removed for clarity.

   Remove the upper and lower steering column shrouds.
   1. Remove the screws.
   2. Remove the lower steering column shroud.
   3. Remove the upper steering column shroud.



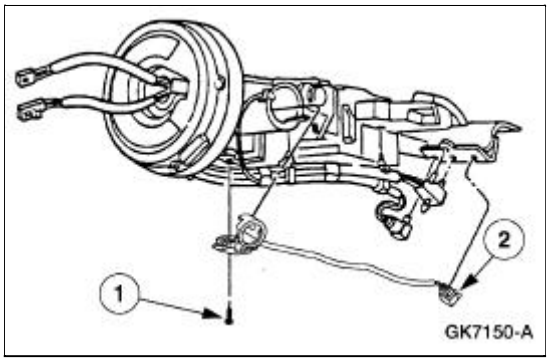
6. Remove the instrument panel steering column opening cover reinforcement.
   1. Remove the bolts.
   2. Remove the instrument panel steering column opening cover reinforcement.



7. **NOTE:** The steering wheel has been removed for clarity.

   Remove the anti-theft transceiver module.
   1. Remove the screw from the bottom of the transceiver module.
   2. **NOTE:** Only apply pressure or leverage below the key cylinder lower rib.

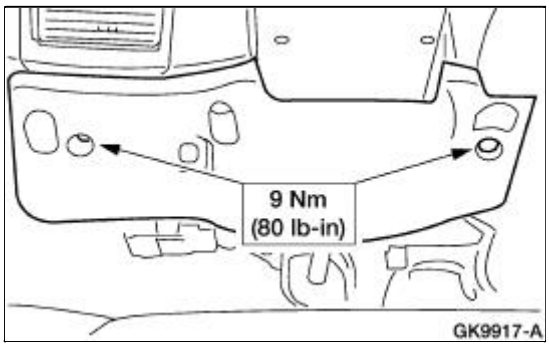
      Disconnect the electrical connector and remove the module.

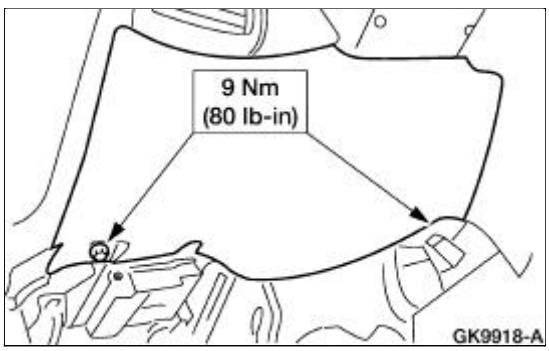


Installation

1. **NOTE:** When the is battery disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

   To install, reverse the removal procedure.





Torque Specifications

Description	Nm	lb-in
Battery ground cable bolt	7-10	62-89

Module Controlled Functions

The generic electronic module (GEM)(14B205) is the only multifunction control module on this vehicle.

The GEM controls the following functions:

- warning chimes and warning lamps
- one-touch down window
- windshield washers and wipers
- battery saver
- illuminated entry with keyless remote entry
- interior lighting

Multifunction Electronic Module

For warning chime concerns, refer to Section 413-09 .

For courtesy lamps/illuminated entry and battery saver concerns, refer to Section 417-02 .

For one-touch window concerns, refer to Section 501-11 .

For wiper/washer control and interval timer concerns, refer to Section 501-16 .

For keyless entry and power door lock concerns, refer to Section 501-14B .

For anti-theft concerns, refer to Section 419-01 .

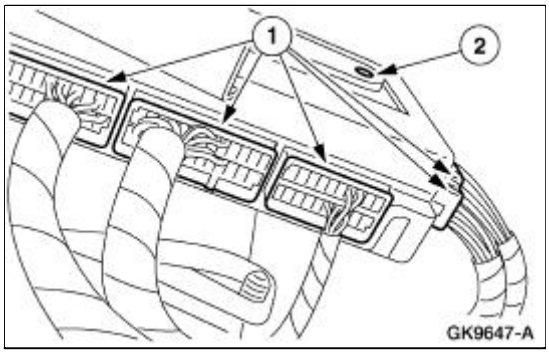
Module —Generic Electronic (GEM)

Removal

1. **CAUTION: Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.**

   Disconnect the battery ground cable (14301).

2. Remove the generic electronic module (GEM)(14B205).
   1. Remove the five electrical connectors.
   2. Release the locking tab and slide the module off the bracket.



Installation

1. **NOTE:** When the battery (10655) is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 10 mile s (16 km) or more to relearn the strategy.

   To install, reverse the removal procedure.